

### ABSTRACT

Methods for forming a nitride barrier film layer in semiconductor devices such as gate structures, and barrier layers, semiconductor devices and gate electrodes are provided. The nitride layer is particularly useful as a barrier to boron diffusion into an oxide film. The nitride barrier layer is formed by selectively depositing silicon onto an oxide substrate as a thin layer, and then thermally annealing the silicon layer in a nitrogen-containing species or exposing the silicon to a plasma source of nitrogen to nitridize the silicon layer.

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